Green Schools News

EmPOWERing Maine Students to Know Their SOURCE

Winter 2005 **Volume 5, Issue 2**

Let's Enjoy the Breeze with Wind Energy

Students at MEEP's Energy Education Leadership Workshop use wind to produce electricity.

Students at this past fall's MEEP workshops tested out our new wind turbine activity. They really enjoyed building miniature wind turbines, then testing them out in front of a wind source. Students knew they were successful when their LED lightbulb became illuminated! One teacher at the Bethel workshop commented, "I liked the wind power activity and how it tied into Maine current events."

This new wind energy activity will give your students insight into a very important current event happening right here in the state of Maine. A wind farm, or a collection of electricity producing wind turbines, has passed the final planning stages and is soon slated for construction on top of Mars Hill Mountain in Aroostook County.

Continued on page two

Hydrogen: The Future of Energy is Here in Maine

Is hydrogen the solution to our energy independence? MEEP is here to help you explore this topic with your students. Hydrogen is a zero-emission, no greenhouse gas producing fuel, once it is produced and stored. Does this sound a little far-fetched, a little futuristic? Think again. In the near future, Maine will have a hydrogen producing facility right in Wiscasset.

The Chewonki Foundation, already home to a display and demonstration of a number of renewable resources, is about to launch Maine's first demonstrated use of hydrogen for electricity production. Although small scale, it will help prove that hydrogen is a viable option for electricity production. It will be used as a backup system if electricity should be disrupted in Chewonki's Center for Environmental Education.

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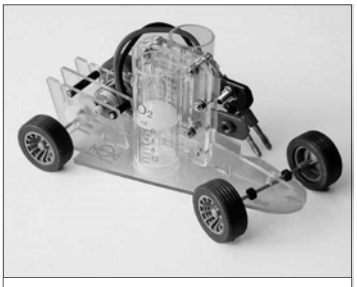
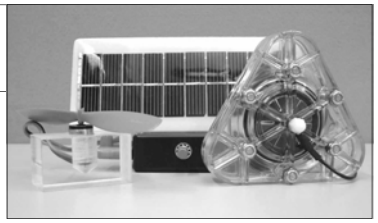


Produce hydrogen and watch MEEP's fuel cell car race around your classroom.

This reversible fuel cell will turn water into hydrogen and then electricity in front of your students' eyes.



Check out MEEP's new **Wind and Hydrogen Activities** and bring a hands-on version of these revolutionary current events right into your classroom!

Green Schools News is a publication of:

Maine Energy Education Program (MEEP) and the Maine Department of Environmental Protection, Air Bureau (MDEP)

IN THIS ISSUE:

Breathing Easier in Freeport

Choosing how to get around is the single most significant environmental decision any American can make; and students at the Mast Landing School in Freeport have learned about how to make transportation choices that can make a difference in air quality. They got involved in a local community service initiative**,** the **Freeport Clean Air Project**, and were treated to a special afternoon workshop.

Fourth and fifth graders there participated in a *Transportation-Alternatives Scavenger Hunt* where they visited a series of exhibits to hunt for answers on the topics of Alternative Fuels, the History of Transportation, and Air Quality. They practiced their group decision-making, map reading, budgeting and time management skills in a game called *Getting Around Clean & Green* (an alternative transportation activity). Students were given some 'money', a map of Portland and various entertainment opportunities to choose from while visiting the city for a day. After each student team agreed on which activities to do on their day in Portland, they had to figure out how to get from the airport to each entertainment venue (without using a car), and eventually end up at the boat landing in time for the ferry to Nova Scotia. Their transportation choices included which routes to take and whether they'd be walking, biking, taking the bus or taxi.

Continued on page three

"Watts" on the Web?

- **www.kidwind.org**
  Would you like to integrate a lesson on wind energy into your schedule? Check out the kid wind website for great activities and ideas. You can also purchase materials to build your own wind turbine

- **www.schoolpowernaturally.org**
  50 schools across New York have small photovoltaic systems on their roof. Anyone can check out the real time data, and view curriculum plans for grades 5 through 12.

- **www.cyberschoolbus.un.org**
  Connect your students to pressing issues throughout the world! Visit this United Nations website for teaching ideas on such topics as world hunger, poverty, and indigenous people while encouraging your students to be socially responsible citizens.

Wind Continued from page one

Mars Hill Mountain, which is already home to cell phone towers and a ski area, will experience as many as 33 wind turbines. Predicted to produce 40 – 50 Megawatts of electricity at full capacity, the wind farm will provide electricity to between 24,000 to 25,000 Maine homes. When the wind farm construction is complete and producing clean electricity, Maine's Director of Energy, Independence and Security, estimates an annual savings of as much as 120,000 tons of Carbon Dioxide (CO_2) (a greenhouse gas and contributor to global warming) compared to dirtier forms of power generation like coal. This is the equivalent of driving 340 million less miles per year.

One issue faced by the construction of the wind farm is that of the effects of bird and bat populations. According to Evergreen Wind Power, the developer of the Mars Hill wind project, studies around the world regarding this type of wind turbines being placed on top of Mars Hill have minimal affects on birds and bats. As a condition of the construction permit, Evergreen Wind Power must inform Maine DEP upon receiving financing for the wind farm. Evergreen Wind Power must then begin pre-operational wildlife surveys within 30 days of that financing and continue wildlife monitoring after completion of the farm.

What better way to celebrate this renewable, non-polluting energy source than by adding a great, fun, and, educational hands-on activity to MEEP's already packed treasure trove of activities. For more information on MEEP's activities that you can bring into your classroom, contact Peter Zack at (207) 625-7833.

Seeing the Light is Easy at Bangor's Photonics Teaching Lab

Most of us take light for granted, until we stumble in the dark. Scientist Ralph Chapman and colleague, educator Fred Woodman, think about it every working day! With a grant from the US Department of Labor this dynamic team created and now staff the Photonics (everything to do with light) teaching lab at the Bangor United Technologies Center.

A photovoltaic module and wind turbine produce electricity at the Photonics Teaching Laboratory.

With its first year now behind them, the lab had 2,000 students from grade six to college come in groups of up to 20, free of charge, for tours and demonstrations. An important part of the presentation is renewable energy and energy efficiency. Demonstrations include comparing different types of light bulbs, working photovoltaic modules, wind turbines, and many other principals & applications of light. If you teach in Maine Vocational Region #4, transportation costs can be paid by the lab. A special bonus is a free gift pack full of neat stuff to continue experiments in your class!

So, if you ever wanted to see a laser in action or watch people through a one way mirror, call Ralph or Fred at 942-5296, or e-mail Fred at ***fwoodman@utc.utc4.k12.me.us*** and arrange a tour of the exciting field of photonics at 200 Hogan Road in Bangor.

Breathe Easier Continued from page two

Community project leaders, Joan Saxe and Andy Burt, also provided a brief description of the no-idling campaign and how this simple action can help improve our air quality. They explained that parent volunteers had been approaching drivers as they picked up their children at the school and had asked them not to idle if they had to wait more than 30 seconds. The students were invited to help spread the word and bring home some puzzles and word games about things they learned in the workshop**.** So, if you visit any of the schools in Freeport, look for the *Clean Air Zone – no idling* signs; don't be surprised if some youngster approaches you and mentions how to "turn it off and breathe easier", because you, too, can make a difference!

Calling all teachers!

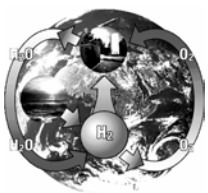
Have your students participated in an environmental project or have taken initiative to make your school greener? Contact MEEP to have your story shared with other Maine schools in an upcoming edition of the Green School News!

Hydrogen continued from page one

Because hydrogen does not exist in pure form on earth, it must first be produced from a compound that contains hydrogen, such as water. A piece of equipment called an **electrolyzer** will break down water into hydrogen and oxygen. At Chewonki, green electricity, electricity from renewable resources, will be used to power the electrolyzer. The hydrogen will be stored and all that is released is oxygen. If Chewonki's power is disrupted, the **fuel cell** will utilize the hydrogen to make electricity. For more information on Chewonki's hydrogen project, including outreach activities, please visit ***www.chewonkih2.org*** contact Peter Arnold at (207) 882-7323

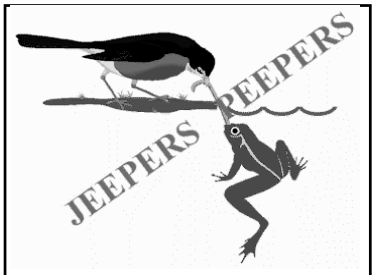
Hydrogen can also be used to power vehicles and to replace gasoline. Researchers in the United States are already designing and testing hydrogen fuel cell vehicles. Go to ***http://www.epa.gov/fuelcell/index.htm*** for more information on fuel cell vehicles. In terms of energy independence, the greatest downfall of hydrogen is that it must be produced first, a process that most often requires the use of fossil fuels.

Is it still a little hard to imagine fueling your car with hydrogen? MEEP actually has a demonstration model hydrogen fuel cell vehicle we can bring into your classroom as well as a mini fuel cell and electrolyzer that can be used to make a fan spin. In addition, MEEP's Alternative Fuels Debate activity allows students to investigate the pros and cons of hydrogen as a transportation fuel, as well as a number of transportation fuels. For more information on MEEP's hydrogen activities or to schedule a visit, contact Peter Zack at (207) 625-7833.



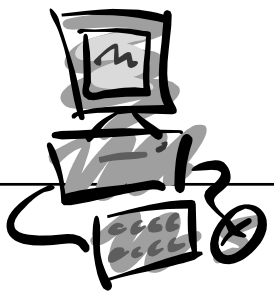
Is Spring Coming Earlier Each Year?

A data analysis activity using ice out dates



Swimming, boating, and fishing attract people from all over the northeast to Maine lakes during the summer. In winter Maine lakes offer skating, snowmobiling and ice fishing until late winter when the ice starts to melt. In olden days, people used lakes instead of roads and often floated logs to mills when there was no ice. The day when all the ice disappeared is called "ice out". These people who used the lake for work started keeping track of "ice out" as early as the 1880s.

Today, scientists continue to record the date of "ice out" using Julian days. Instead of using months they just number the days starting with January 1 as day one. February 1 would be day 32 and March 1 would be… well that depends if it is a leap year. The U.S. Geologic Survey (USGS) has compiled ice out dates for 29 lakes in New England in a report available on the web. (See Step 1)



The following ecological research activity makes a great classroom project throughout the year. There is even an assessment rubric aligned with the Maine Learning Results. Please go to ***www.mainedep.com*** and click on Jeepers Peepers to check it out!

Essay Question

Is spring coming earlier each year? Using USGS data from Maine Lakes provided on the Maine DEP web site, your task is to answer this essay question in 500 words or less; be sure to include your ideas along with supporting evidence (details) from the data and graphs. Use the following four steps to guide your analysis and report format when writing your essay.

Step #1: Go to web site ***www.mainedep.com*** and select the spreadsheet entitled: "ice out data" (Excel or Apple). Select <u>two or more</u> lakes and create an *XY scatter graph* for each. Put *"year"* on the X axis and *"ice out date"* data on the Y axis. Add a trend line or trend line equation to the graph.* Use the trend line equation to determine if ice out dates have changed over time. Describe how "ice out dates" have changed over time in each of the lakes you selected.

Ice out on Sebago Lake, spring 1985 (USGS)

** To create a trend line or equation: In Excel, right click on one point data on the graph and select add a linear trend line. In Appleworks, see other instructions for trend line equations.*

Step #2: Using the data, "Average Spring Temperature", create an XY scatter graph and trend line for the weather station that is closest to your lakes' locations. Again "year" should be on the X axis and "temperature (average March to May)" should be on the Y axis. Describe how the temperature trend has changed over time.

Step #3: Compare and contrast similarities and differences between the ice out data and air temperatures. Do you think this data shows a trend that may serve as an indicator of earlier springs overall? Explain your thinking: describe at least <u>three</u> observations or inferences about the data.

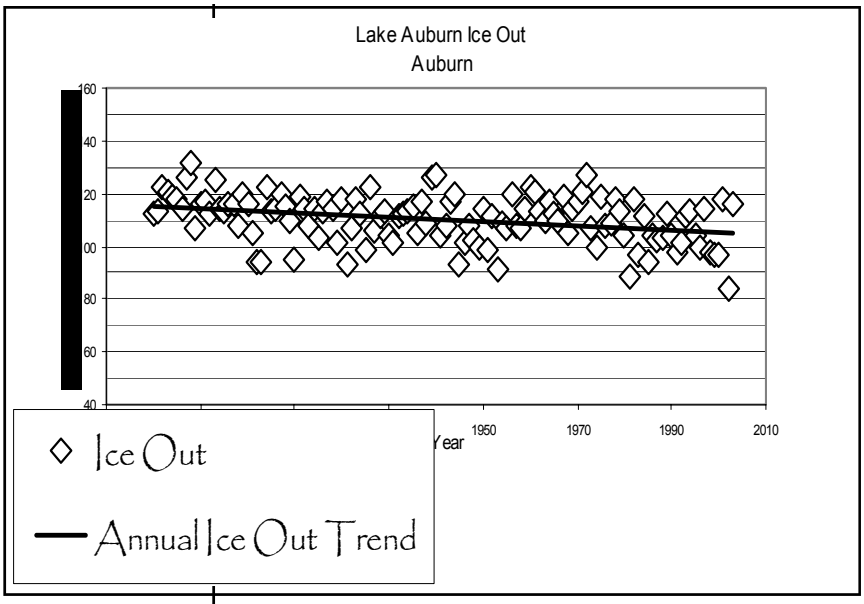
Step #4: What other indicators might help you to answer the question: Is spring coming earlier each year? Describe at least <u>two</u> and explain your thinking. If you were a scientist continuing to investigate climate change, what additional research questions would you explore? Describe at least <u>one</u> new question for research.

Report Format

Use the following sample format to write your essay (500 words or less). Be sure to address the questions posed in 1-4 and provide supporting details for your ideas and inferences.

- **Introduction -**
  Briefly, what is this essay/report about?
- **Body -**
  -Describe your findings, graphs, and observations. (Steps 1-3)
  -What are some indicators of spring you would be interested in studying further?
  -What additional research could you do to investigate climate change further? (Step 4)
- **Conclusion -**
  Summarize your findings and observations.

Sample Graph of Ice Out Data



Detailed directions to create graphs in Excel or Appleworks can be found on the Jeepers Peepers Essay Contest web page: @ ***www.mainedep.com***

Here are more great strategies to introduce climate change topics in your classroom

Jeepers Peepers 2005!

Join other classes in Maine by tracking the arrival of spring in the sixth year of **Jeepers Peepers Springwatch project**! Watch for the return of spring peepers, dandelions, robins, and maple budburst. Go to ***www.mainedep.com*** and click on Jeepers Peepers for more information or to register your class to track spring!

You can borrow a Climate Change Back Pack and schedule an introductory classroom presentation today…

The Climate Change Back Pack is full of curriculum ideas, games, and activities for use in the classroom. Upon request, we can even come into your classroom to do a few activities to help teach your students about this important topic. Coupled with the climate time machine activity (below), these activities make a great climate change session. Contact Jeremy Dubois at (207) 287-4855 or Peter Zack at (207) 625-7833 to borrow a backpack or schedule a visit!

The Climate Time Machine Biomonitoring Activity

How do scientists study climate change? In this activity, students jump on the climate time machine and with a hands-on experience, simulate an actual climate change study (using pollen) to track how the climate has changed over the past 20,000 years. Call Jeremy Dubois at (207) 287-4855 to schedule a presentation.

Save the Date and Sign up Today!

Monday, February 28—Start watching for signs of spring in Maine with the start of Jeepers Peepers SpringWatch! Maine students make observations and report data on the web while the DEP staff maps the results weekly. Go to ***www.mainedep.com*** and click on Jeepers Peepers for more information or to register your class!

Saturday, March 12—Free teacher workshop on building solar cars for the Junior Solar Sprint Competition.

Saturday, June 4—Junior Solar Sprint State Finals at the Owls Head Transportation Museum.

And the Winners Are…

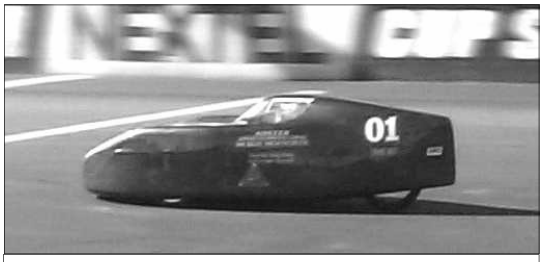
To celebrate October as Energy Awareness Month, Maine's Office of Energy Independence and Security and Efficiency Maine held an energy saving contest for Maine's 4th through 6th grade students. Winning tips are listed below and on the back page. Contact Efficiency Maine's Joy Adamson at (207) 287-8350 or ***joy.adamson@maine.gov*** to enter next year's contest.

Winning Energy Savings Tips:

4th Grade, School: "Install optical sensors that would detect whether there was enough light in the classroom, and would turn on the lights only when needed (ex. cloudy days)." Will Benoit, Mary Snow School, Bangor ***More tips on back page***

The Two Percent Solution: Mt. Blue Electrathon

It was a January day in the pre engineering Electrathon class at Foster Tech Center, Mt. Blue High School. A dozen or so students were clustered in sub groups around the workspace, assigned through different tasks with improving their single person electric race car. Some were tinkering with the electrical system; others were testing batteries. Fran Marchand, a visiting tech ed teacher from Sacopee Valley High School, moved from group to group asking questions and observing the process. Another interested onlooker was Michael Lewis, an independent Electrathon driver from Portland and former national record holder. Teacher John MacDonald had exhorted his charges to find ways to elevate their vehicle's efficiency by two percent.



With it's sleek design, Farmington's MBHS car now holds the national electrathon record.

Two percent? A modest challenge, one might think. But Mt. Blue's green #01 was less than three months removed from its grandest hour. On October 28 the team competed in the Electrathon National Speed Trials at New Hampshire International Speedway in Loudon, NH, an event that Lewis had organized. On that vaunted track, Mt. Blue bested 12 other vehicles (including three from the west coast) in eclipsing the national speed record held by Lake Orion High School in Michigan. In exactly one hour, driver Nathan Pickrell guided the #01's sleek composite body around the slightly more than one mile long track 50 times. Or was it 49 times? Lap counters disagreed on the tally. When the race video suffered an accidental erasure of its final two minutes, the real outcome was consigned to conjecture. Either way, it was a record setting effort. Fifty laps meant an almost 51 mph average speed; 49 laps put the average at 49.8 mph. The old record was 49.17 mph.

Back in the classroom, several students were creating a scale model of a solar assisted vehicle. Peter Farnham, Alex Prentiss and Erik Gilbert had taken on this design exercise as an independent study, as MacDonald is contemplating a foray with his program into the arena of photovoltaics---solar electricity. What kind of value does this Electrathon course have to its clients, the students? For Farnham it's "good for college competition", a feather in his cap. Prentiss intends to go to an engineering school and sees the Foster Tech pre-engineering class as important preparation. Gilbert also has his eyes on college. He views his experience with composites as "not very common", a plus in his application.

These kinds of comments will not be lost on Fran Marchand as he returns to Sacopee Valley and shares his day with principal Andy Russell. Russell, a former Electrathon teacher when he was at Bonny Eagle High School, is already a supporter of the program. While he understands the demands on a teacher to sustain a program of this sort he, like MacDonald, values what it can offer to students---experiential learning connected to real world content.

Greenhouses at Schools are "Growing" Hands-on, Interdisciplinary Education for Students.

From nutrition to mathematics, greenhouses are being used in Maine schools as an interdisciplinary learning tool. Two such schools, Fort O'Brien School in Machiasport and Troy Howard Middle School in Belfast have relatively new greenhouses, but have proven to be successful in their teaching goals.

Troy Howard Middle School

"Because its fun!" Often when in class, these are the last words expected out of a middle schooler's mouth. Yet, at the Troy Howard Middle School (THMS) Greenhouse in Belfast, the phrase is common place. Why? While taking regular classes, students are gaining experience running a small business, interviewing for jobs, and managing finances at the THMS Garden Project.

In January, students at THMS tend to crops.

Even in the dead of winter, the greenhouse at THMS gets plenty of use.

"The key is interdisciplinary, hands-on, real world learning opportunities," explains agricultural coordinator Don White. Together, he and Team Leader, teacher Steve Tanguay lead the Garden Project. In *social studies*, Tanguay teaches students about *Maine history* by having students grow a Maine themed garden, comprised of plants from Maine. In *math*, students learn fraction and ratio skills in order to construct scale models of the garden. They also learn money management and financial skills in *economics*, both of which are very important life skills. Because the food is organically grown, locally some seeds are collected and sold to local farmers. Fossil fuel use is kept at a minimum, because such food, which normally travels one to two thousand miles before it arrives at the local super market, is used right in the community.

Students are part of the greenhouse process the entire way. They entered their produce into competition at the Common Ground Fair, where this year they won an impressive 28 ribbons. Students celebrated with a pizza supper in which the pizza was made completely from scratch, including the dough from wheat grown in the garden. The only ingredient needed for the pizza not available from the garden is the cheese!

Keeping business local, learning about the local economy, and reducing the use of fossil fuels, students at Troy Howard Middle School in Belfast are learning life long lessons. For more information on the learning opportunities offered to students at the THMS Garden Project, please visit ***www.sad34.net/garden*** or contact Don White at (207) 338-3320 ext. 321.

Greenhouses help save money, energy, and are a great interdisciplinary teaching tool.

Fort O'Brien School, Machiasport

Students at Fort O'Brien School built their greenhouse two years ago. Since then, they have been learning to eat more healthy and to reduce waste through composting. What started as a nutritional project through the Maine Nutrition Network, has turned into a hands-on learning experience.

"We knew nutrition was a problem when kindergarten students were coming in with baskets of junk food, and instead of running around at recess, would sit down and eat," says 3rd and 4th grade teacher Bonnie Phipps. That's when teachers decided to write a grant to raise money for the greenhouse. As part of the Maine Nutrition Program, Phipps, and fellow teachers Marilee Dennison, Renee Look, and Roberta Lichtenger teach students the importance of eating five servings of vegetables daily. This is where the energy and money saving greenhouse comes in handy.

On Tuesdays and Thursdays, students in grades pre-K to 4 snack on vegetables that come from the greenhouse. Students harvest the tomatoes, carrots, squash, pumpkins, and beans from which parent volunteers prepare the healthy snacks. Learning about nutrition and reduction of waste starts early! For more information on the Fort O'Brien School greenhouse and nutrition program, please contact Bonnie Phipps at (207) 255-4575.

Maine Energy Education Program

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Maine Energy Education Program - Energy Activities in an Ecological Context

Phone: 207.625.7833 Email: meep@psouth.net Web: http://www.meepnews.org

Students challenge their knowledge about energy with MEEP's free curriculum activities. Check inside for great ideas and happenings right here in Maine!

Check out our website at www.meepnews.org

More Winning Energy Savings Tips:
4th grade, Home: "Don't run water when not using it and limit time in shower." Olivia Warner, Plummer Motz Elementary, Falmouth
5th Grade, School: "On sunny days, let the sun light up your room instead of using electricity." T. Overlock, Owls Head Central School, Owls Head
5th Grade, Home: "Riding our bicycles, walking, or driving a car that gets good gas mileage to go places." Madeline L. Minor, LAMMS Homeschool, Winthrop
6th Grade, School and Home: "The teacher should appoint a student a week to have the job of turning off the lights when the class leaves the room for special, lunch, snack…" "Wash your clothes in cold water." Both tips submitted by Maya De Groote, Boothbay Region Elementary

The Maine Energy Education Program Thanks Our Generous Sponsors:

This issue of Green Schools News created by Jeremy Dubois (SERVEMaine Volunteer, Maine DEP Bureau of Air Quality)

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